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COVER

With more and more general aviation aircraft like this Aero Grand Commander flying at altitudes where the air is thin and cold, a new dimension in training is necessary.
For a report, see page 8.

FAA AVIATION NEWS

DEPARTMENT OF TRANSPORTATION / **FEDERAL AVIATION ADMINISTRATION** VOL. 7 NO. 4

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COMMON IFR ROOM

Terminal Radar Control for New York's Big Three Located Under One Roof

Controllers in foreground view horizontal radar scopes, while vertical 9 x 12-foot screens display same data. Left screen controls western half of New York area traffic, right screen eastern half. Newark, LaGuardia and Kennedy Airports have over a million flights annually.

FAA's new semi-automated radar facility, designed to handle IFR arrivals and departures at all airports in the New York City area, began operations on a limited basis last month.

Located at Hangar 11 at Kennedy International Airport, the facility assumed responsibility for control of radar operations at Kennedy Airport on the night of July 15. Radar control functions at Newark will be switched over in mid-August and those at LaGuardia Airport in mid-September.

When the relocation of all three terminal radar control operations is completed, controllers and equipment needed for handling aircraft operating IFR at six secondary airports and two downtown heliports, as well as the three major hubs, will be under one roof. The facility brings together more terminal operations than have ever been consolidated anywhere before in air traffic control. In 1967, Newark, LaGuardia and Kennedy IFR rooms handled over 1.3 million flights.

The new "common IFR room," as it is known, will improve coordination in handling flights among the 11 New York City airports, with new traffic control tools provided for the first time to terminal controllers.

In addition to the traditional radarscope for active control of aircraft, the common IFR room uses two 9 by 12 foot rear projection large screen displays, similar to those used in theater showings of closed circuit TV sporting events, to display the radar air picture. A small image on the radarscope is illuminated by an arc light, and then reflected through a series of lenses and mirrors to the back of the screen.

The greatest immediate benefit of the common IFR room will be more flexibility in the use of the limited airspace over New York City. When terminal traffic in this area is controlled from three separate IFR control rooms at Newark, LaGuardia and Kennedy Airports, it is necessary to have rather large, inflexible buffer zones between the air space assigned to each control facility. Coordination by telephone between the various IFR rooms is relatively slow, compared to side-by-side coordination in the same room. Excessive amounts of airspace were needed, and much time was wasted.

When the new facility is in full operation at Hangar 11, controllers working either of the two major control areas will almost be able to reach out and touch controllers working the other area. With this close proximity among the controllers, the airspace buffers can be greatly reduced in size, and the boundaries can be shifted almost instantaneously, when necessary.

For purposes of air traffic control, the new common IFR room will divide the New York area into two major sectors: the western sector will be served by the Newark Airport surveillance radar, and the eastern sector will be served by the Kennedy Airport surveillance radar. An air route surveillance radar, located at Kennedy Airport also, will be used for control of overflights. By the Spring of 1969, controllers will have the benefit of computer assisted displays. Aircraft targets or "blips" on radar displays will be automatically tagged with alphanumeric flight information blocks that follow the blips across the display. The automated data processing in the new common IFR room will also make possible automatic display of aircraft altitude for appropriately equipped aircraft.

In order for alphanumeric data originating in the computer complex to be displayed,this data must first be changed into TV form. This task is performed by an alphanumeric generator, which accepts coded digital data from the computer complex and converts it into TV-form signals.

The displays will be updated by the computer complex every 2½ seconds to provide a dynamic picture of air traffic.

For pilots, this will mean that regardless of whether they are flying into one of the major airports, such as Kennedy International, or into one of the smallest of the 11 airports in the New York City area their flight movements will be observed by controllers working virtually side by side in the same room, who will be able to give the maximum assistance possible under all circumstances.

If the New York common IFR room performs according to expectations, it will set the pattern for unitized air traffic control operations in the major terminal areas of the country.

Don Byers

Not long ago, an FAA General Aviation District Office chief in Colorado watched a storm pound a row of tied-down light planes. Winds of hurricane force with gusts up to 85 knots had the aircraft dancing on their tethers. One plane seemed to be getting a particularly rough going over.

He remembered this the next day when he saw the pilot walk purposefully to the storm-abused aircraft, get in, taxi away, and take off without even a hit-or-miss preflight—not so much as a cursory walk-around.

Considering the violence of the storm, the plane could easily have been damaged in a number of obvious or subtle ways. Wind-blown debris could have lodged in the air intakes or in the spaces between elevators, ailerons and rudder. The high winds could have buffeted unlocked flight control surfaces, causing hidden damage.

Hard-driving rain, entering the aircraft, could have pooled in the fuselage, upsetting the center of gravity and creating a sloshing condition that could make the plane unstable; and possibly shorting out radio and electrical circuits. If the airplane had been tied down with manila, which shrinks when dampened, airframe damage not readily noticeable but hazardous to flight could result.

Did this pilot pay any penalty for rashly assuming that the preceding day's storm hadn't damaged his plane? Not on that trip, but two months later he was killed when he stalled and spun in. Was the stall connected with some overlooked pre-flight check, such as a partially blocked pitot tube that gave him a false airspeed reading? No one will ever know.

This accident, and the 580 other general aviation accidents recorded in Colorado during the five-year period from 1962 through 1966, prompted the Denver GADO to launch an accident prevention counter-attack called the "Colorado Plan," a broad front educational campaign. The chief weapons were safety bulletins covering airmanship, weather, and mechanical defects.

The study that led to the "Colorado Plan" also revealed that the preponderence of accidents involved pilots with 100 to 300 hours. Denver instructors were converted into "missionaries of safety" to reach students and low-time pilots.

One of the "missionaries," a pilot examiner and fixed-base operator in Greeley, Colo., conducted a "preflight contest" that pointed the finger at a prime accident suspect. Acting on a suggestion from the Denver GADO, he "gimmicked" an aircraft during a flight safety symposium. He invited participants to try their hand at preflighting it, *and warned them in advance that the plane had a number of deliberately planted "bugs" that were either hazards to flight or were violations of Federal Aviation Regulations.*

Is the pre-flight inspection ignored or glossed over because pilots do not know what to look for? Or because they do not take the procedure seriously? There is reason to think both reasons are valid.

In all, the aircraft harbored 15 discrepancies. The top score was logged by a man who found only *six*.

Most of the participants in the pre-flight check overlooked a nearly flat tire partly hidden by a wheel pant, a deflated nose wheel strut, magneto in the "on" position, gas cap missing, reversed position lights, a brightly colored fishing fly in the pitot tube, static ports taped over, a bolt missing from the elevator, a cotter pin missing from an aileron bolt nut, and cowl flap fasteners disconnected.

Overlooked too by most of the contestants was a disconnected magneto "P" lead which was looped through the ring in the oil dip stick. Few made note of the fact that the plane had no documentation—aircraft registration certificate or airworthiness certificate—both required by FAA regulations.

"One thing the pilot contestants all lacked in common—a systematic approach to the job at hand," said an FAA inspector who watched the proceedings. "Each one of them just tackled the plane in a hit-or-miss fashion. Mostly, they missed, as the results showed."

A prepared checklist is the only reliable way to conduct a pre-flight inspection. A standard ingredient in all owners' manuals, the checklist is supplemented in larger, more complex aircraft by a separate card. The card not only covers pre-flight, but in most cases, includes engine start-up, taxiing, takeoff, landing and shut-down procedures. These are carefully programmed so that a pilot can make the required inspections in a logical, step-saving sequence that leaves nothing uncovered.

An important part of the shut-down, or post-flight procedure, is the "squawk sheet" provided by many operators who rent aircraft. This is the place to write down any and all complaints about the aircraft's performance, including things that just don't "feel" right. This enables the operator to take prompt remedial action and could very well head off an accident. It is better to err on the side of being considered too fussy than to ignore a condition that might be the first sign of an incipient accident.

If the airplane is personally owned, it is the owner's responsibility to correct deficiencies as they occur. Memory is a poor ally here—write the descrepancy down while it is still fresh in mind, and pass it on to a mechanic for whatever action is necessary.

A fuel guage that has to be thumped by the heel of the hand periodically before it shows a diminishing supply, is an example of a comon "minor" deficiency. An airplane that has a tendency to drift from one side to another while taxiing might be trying to tell the pilot to check the brakes for dragging, or the wheels for toe-in (or toe out), or camber. An airplane that develops stiffness or looseness in the controls might be signalling for a rigging check.

Written notes should be made whenever something is removed from the airframe or engine, regardless of how short a time the part is to be absent. Similarly, whenever an airplane is "rigged" for any special purpose, as the case of the Denver GADO preflight contest, a list should be made of exactly what was done.

When the plane is restored to flight status, the list should be systematically checked off as each discrepancy is corrected, however trivial. A rag deliberately planted in an air intake is easily overlooked, as is a cotter pin removed. The natural eagerness to begin a flight, which can obscure the most obvious impediments to a happy landing, can only be countered by means of a rigorous ticking off of every item on the checklist. All good pilots do it. ■

how sharp is your plane sight?

Would you fly this airplane?

A number of hazards to safe operation were deliberately incorporated into these pictures to test your visual acuity and airmanship. If you think it's always "the other guy" who neglects his walk-around, or seemingly does it "with his eyes closed," make a visual tour of the airplane shown in these four photos. Then turn to page 13 to see if you missed anything.

The Friendly

Introducing FAA's

Central Region safety experts Chet Davidson, L. J. Cox, and Lester J. Cooling, leave the Kansas City GADO en route to a safety seminar to explain the new mission.

He will not be wearing a white hat, but you will be able to tell right away that he is a good guy. He represents the modern approach to flying safety—the "friendly persuasion" method of accident prevention.

He is available for pilot seminars, instructor clinics, check rides, as well as coffee-and-conversation about flying. He is well-versed on the latest FAA regulations and procedures, and he is an accomplished pilot in his own right. He is one of the 32 newly created ***accident prevention specialists*** assigned to FAA's General Aviation District Offices, under Project 85.

Project 85 is being developed by FAA's Flight Standards Service as part of an effort to achieve a major breakthrough in accident prevention. Accident records for a 15-year period, 1951 to 1966, show a gradual decline in the accident rate per hundred thousand hours flown, both for fatal accidents and non-fatal accidents.

In 1961, the overall accident rate per hundred thousand hours of flight time was 45.2 and the fatal accident rate was 5.2. In 1966, according to figures recently released by the National Transportation Safety Board, the overall accident rate was 27.17 and the fatal accident rate was 2.73.

Nevertheless, *total* accidents, injuries and fatalities in 1966 reached an all-time high, because of the greatly increased number of persons and aircraft now active in general aviation. There were 5,712 accidents in 1966; 573 of them fatal, with 1,151 persons killed.

The goal of Project 85 is to reduce the accident figures significantly. Originally named for the 85 FAA General Aviation District Offices (the number has now been reduced to 81), this project is designed to provide the GADOs with an official whose primary job is not the inspection of aircraft or airmen to see that they are in compliance with FAA regulations, but a man who will spend 95 per cent of his time getting to know the pilots in his district, their flying habits, and their flying problems, if any.

Project 85 recognizes the fact that most professional instructors are too busy with their instructional duties to sit down and chat leisurely with the pilot who may have some secret doubts about his own proficiency in some aspects of flight. Some pilots, who appear to be extremely competent when the instructor is in the right-hand seat, experience a great deal of uneasiness and uncertainty when they are in the cockpit alone. This kind of lack of confidence can easily lead to panic on the part of the pilot and to accidents of a more or less serious nature unless someone is in a position to build up the pilot's confidence in himself.

The concept of the accident prevention specialist as a counsellor was intended to fill this need.

Project 85 began officially on July 1 of this year with the assignment of 18 accident prevention specialists to the Central Region, and 13 to the Southwest Region. A two-year evaluation of the program in these two regions will determine the future of the project. If satisfactory progress is made, all regions will be supplied with the specialists in two years or less.

The original 31 accident prevention specialists were selected from several hundred applicants, all seasoned GADO veterans. A screening process singled out those applicants who had the deepest interest and personal conviction with regard to aviation safety. Above all, they had to have a positive attitude toward accident prevention.

Chosen applicants also had to have extensive general aviation backgrounds acquired either as a pilot, licensed instructor, or in business flying operations. And they needed an expert understanding of FAA's general aviation organization and the function of GADO inspectors, supervisors and other personnel.

They had to be able to communicate well, to speak easily and effectively to groups or individuals, to point out errors without

Above—Davidson uses hand to show young pilot correct chandelle entry technique. Below —Nose too high, bank too steep, eloquent hand shows common chandelle errors.

Accident prevention specialist Dick Giffen, Ft. Worth GADO, chats with student and instructor. Specialists will make a point of person-to-person contact.

ly Persuaders

FAA's New Accident Preventers

Under FAA's new program, safety is brought to the pilot. This group is being instructed in the effect of altitude and temperature on the takeoff performance of a light twin. Accident prevention specialists are all expert pilots.

scolding, and to teach without talking down to pilots. They also had to be able to write clearly and to the point.

Finally, they had to have a broad understanding of the primary causes of aviation accidents — involving human, mechanical and environmental factors.

Because of their GADO background and experience, most of the 31 accident prevention specialists chosen had already received formal training in aircraft accident investigation. A profile of the successful applicant shows the average man to be about 40, married, with 20 years of experience in aviation. He has an air transport rating and is multi-engine qualified. He has had extensive experience as a flight instructor and the chances are 50-50 that he is jet-rated. He probably has some background either as an air taxi operator or charter pilot or in fixed base operations. He may also be qualified as a helicopter or a glider pilot. He may have done some crop dusting. He has about 8,000 flying hours in his log book.

Despite the impressive background of the successful applicant, a four-week course has been developed at FAA's Aeronautical Center in Oklahoma City to further ready the specialist for his post. The first two weeks of the course is a refresher in flying techniques. The second two weeks is a kind of salesmanship course in accident prevention. This course concentrates on the psychology of human relations—on the best means of stimulating local participation in aviation accident prevention programs. The specialists also will be taught how to look for patterns of accidents in their areas and for indications of pilot uncertainty over procedures and maneuvers that are a necessary part of their flying program.

Each accident prevention specialist will be responsible for all accidents occurring to pilots from his district, regardless of where the accident actually takes place. Similarly, he will not be responsible for accidents which happen in his area to pilots based elsewhere. The reasoning behind this localization of responsibility is that the specialist can be most helpful to pilots if he is on the alert to seek for certain habits of flying or conditions of flight which are peculiar to his district which could be playing a part in accident causes.

An evaluation every six months will indicate which districts of the two regions being initially supplied with accident prevention officers are showing the greatest benefit and which the least. Since the future of the whole Project 85 hangs in the balance, the original 31 specialists will be going all out to bring about a drastic reduction in accidents in their districts.

Although it may sound like little more than "coffee and sympathy," the services of an accident prevention specialist may turn out to be, in the long run, a pilot's best insurance for staying out of the accident statistics column.

Frank J. Clifford

"Know Thyself!"

Physiological Training Prepares Pilots For Sudden Environmental Changes

William Staub

Everyone who flies an airplane is likely to be exposed at one time or another to low pressure, low temperature, or rapid movements in three dimensions. Hypoxia, frostbite, and vertigo or disorientation are three possible results of this exposure. For the past seven years, FAA has made physiological training available to all pilots as a means of preparing them for such exposure in flight. To date, over 5,000 pilots have availed themselves of this opportunity and consequently are better prepared to deal with all possible flight hazards.

To many persons, physiological training suggests the idea of altitude training only. But the FAA-sponsored physiological training is as much concerned with the effect of vertigo or extreme cold on the pilot as it is on deterioration of the oxygen supply. An examination of recent statistics has shown that some 30 per cent of general aviation aircraft accidents are attributable to one of these three forms of environmental exposure in flight.

Physiological training in the military services dates back to World War II when aircraft with service ceilings around 40,000 feet were developed and flown in combat. Early combat aircraft did not have pressurized cabins or effective heating systems. Consequently, whenever missions were flown at altitudes above 10,000 feet, symptoms of hypoxia and frostbite were common among the aircrew. A formal training program was gradually developed to prepare aircrews for these problems.

Broad Training Scope

At the conclusion of World War II, training had evolved to the point where the subjects taught included: physics of the atmosphere, respiration and circulation, trapped and evolved gas decompression sicknesses, oxygen equipment and personal protective equipment, night vision, and disorientation.

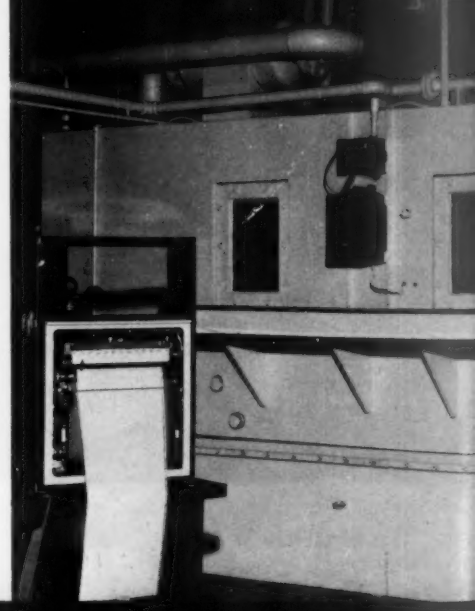
Altitude chamber flights up to 38,000 feet were also made a part of the curriculum. At 25,000 feet, the students were taken off oxygen so that they might recognize their own individual symptoms of hypoxia. They were also taught to check their oxygen equipment and systems if they noticed any hypoxia symptoms in flight, and to get down from altitude if unable to correct malfunction. Later on, when the use of pressurized aircraft began, rapid decompressions were also made in an altitude chamber. In this manner, a crew member could experience a decompression under controlled conditions, and practice donning, checking and monitoring his oxygen equipment as needed.

FAA Program Began in 1960

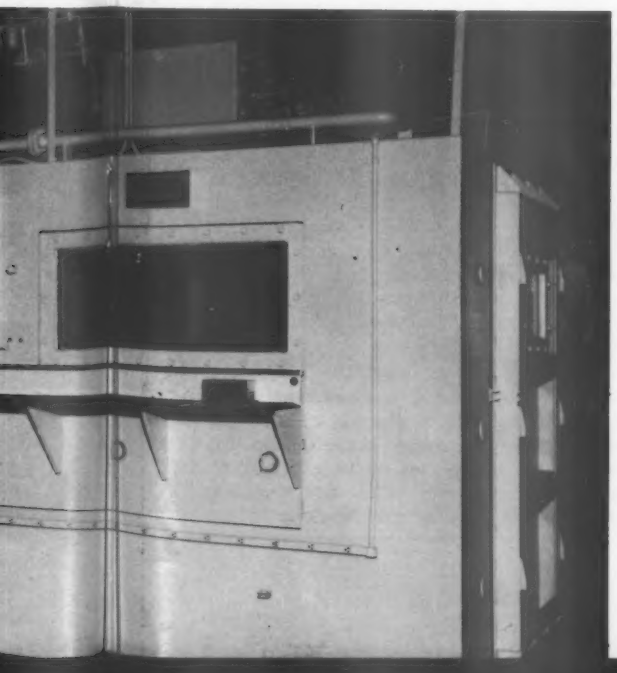
Civilian physiological training is an offshoot from the military program. In the early history of the Federal Aviation Administration many of its leading officials had military service backgrounds which made them knowledgeable about the potential hazards of flight at altitude. They felt that physiological training should be mandatory for certain FAA pilots and crew members. In the process of setting up this safety training program for FAA personnel, it was decided to extend training privileges to all civilian pilots who might be interested.

In November of 1960, the FAA Administrator signed an agreement with the Secretary of the Air Force whereby 30 of the physiological training units of the Air Force opened their doors on a space available basis. (The United States Navy has also permitted FAA pilots to go through its physiological training program. At the present time, however, there is no agreement for the training of civilians at Navy installations). There are physiological training pro-

Left—FAA instructor double-checks oxygen mask f
systems in their planes should pre-adjust their r
Operational details of general aviation oxygen ma
Below—Pressure chamber enables students to si



n mask fit before "flight" in altitude chamber. Pilots having oxygen st their masks to assure tight, instant fit in emergencies. Right—xygen mask are explained before actual chamber work commences. nts to simulate high altitude flight under controlled conditions.



grams at Ohio State University and Lockheed at Sunnyvale, California.

In the Spring of 1963, a Physiological Operations Section was established at the Civil Aeromedical Institute (CAMI) of FAA's Aeronautical Center in Oklahoma City. Laboratory equipment for this section includes three high-altitude chambers and one high-pressure chamber.

In addition to operating a resident physiological training program for FAA and for civilian pilots and aircrew personnel, this section has the responsibility of monitoring the civilian portion of physiological training as conducted by the Air Force for the Federal Aviation Administration. This entails setting up curricula, supplying training aids relevant to civilian pilots, scheduling training, and visiting the training bases for the purpose of resolving problems and for observing the training functions. (The pressure chambers are also used to support independent research tasks carried out by CAMI scientists).

Training Program Is Flexible

A physiological training program conducted at CAMI is a flexible one tailored to the needs of each class. Normally, the classes are limited to eight persons. There is no age limitation—the evidence of good physical health as indicated by a current FAA medical certificate, Class III, makes any pilot eligible. Pilot students in their 60s have taken the course with obvious benefits and no ill effects.

All students are given a brief pre-course oral quiz to determine their level of knowledge. Also, informal discussions are carried out with the trainees to determine the type of aircraft and flight operations with which they are familiar or likely to become involved. The course is then oriented toward their needs.

Basic subjects included in all courses are: physics of the atmosphere, respiration and circulation of the body, principles of vision, noise and vibration, hypoxia, hyperventilation, self-imposed stress, decompression sicknesses, cabin pressurization and decompression, disorientation, survival equipment and oxygen equipment systems. Each course or class lasts an entire day, and is climaxed by an altitude chamber flight up to 29,000 feet where students are permitted to go off oxygen for the purpose of ascertaining and becoming familiar wtih their own symptoms of hypoxia—they vary in individual cases.

Students also undergo rapid decompression from 8,000 to 29,000 feet, in order to experience this phenomenon under controlled conditions—they are then required to don their oxygen masks and check the oxygen system to determine proper orientation.

The trainees at the Aeronautical Center are under constant observation and supervision by FAA personnel. The Air Force physiological program is very similar to the ones given by the FAA at Oklahoma City. The aim of this training program is to provide pilots with an opportunity to acquire both knowledge and experience of certain physiological problems which can be handled when the pilot has prior knowledge of the situation he may encounter. One of the great dangers of hypoxia is that many persons who suffer from it may not understand the cause of their symptoms, or possibly are unaware that they are flying badly. Similarly, disorientation, a phenomenon which can have fatal results when it leads to mishandling of the airplane, is frequently not recognized by the pilot who has had no previous experience with it.

The FAA-sponsored training programs seek to put the pilot on his guard so that at the first indication that he is undergoing a shortage of oxygen, or a spacial disorientation, or cold temperature, he is able to respond in a most effective manner so as to reduce the hazards of this experience, and to remove himself and the airplane if possible from a dangerous situation.

As turbo-charged and jet aircraft increase in number, more and more pilots will be flying at altitudes which could expose them to physiological hazards. The atlitudes above 10,000 feet, while favorable for smooth, high-speed flight, are potentially hostile to the well-being of man. In spite of all the safety precautions which are taken to provide pilots and aircrew with a protective environment in high altitude flight, mechanical failure or pilot error may occasionally occur. When this does happen, it is essential that response to the situation be immediate and effective.

Builds Confidence, Increases Safety

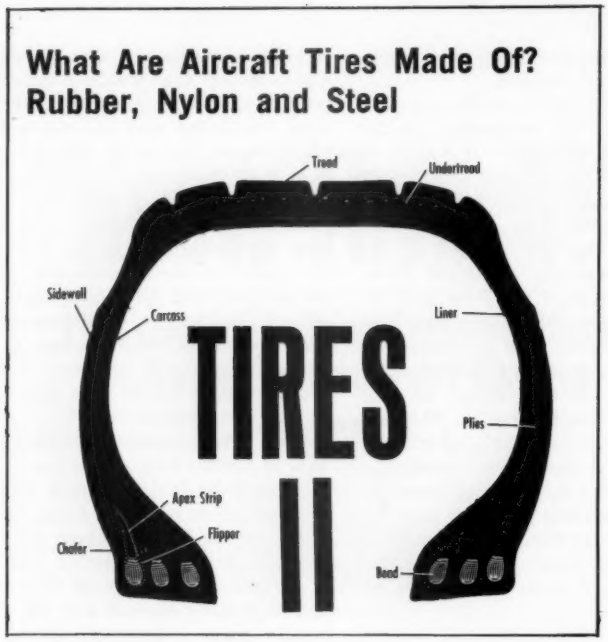
On the whole, general aviation pilots are less familiar with the problems of sudden decompressions than air carrier pilots.

This is all the more reason why general aviation pilots should avail themselves of the opportunity to take this one-day safety program in physiological training. The cost is negligible and the time is inevitably well spent. Even if no occasion should arrive when the experience learned in the altitude pressure chamber is put to use, those who have taken the course are able to enjoy flying with a greater sense of capability and proficiency. They know that if their airplane should be flipped on its back, for example, by turbulence, they will not panic because of the bizarre sensations associated with diorientation.

Inquiries should be addressed to: Physiological Operations Section, AC-165, Civil Aeromedical Institute, FAA Aeronautical Center, P.O. Box 25082, Oklahoma City, Oklahoma 73125, or telephone 405-686-4837/4801.

William A. Staub
Chief, Physiological
Operations Section

What Are Aircraft Tires Made Of? Rubber, Nylon and Steel



Good landing technique will prolong the life of your tires by reducing the need for severe, abrupt braking.

When the need for aircraft tires first developed, about 60 years ago, one of the common tests for sturdiness was to drop the tire from a two or three story building to see whether or not the rubber separated from the wheel. This would not seem to be a very adequate test today when tires must support something like 100 tons of jet airliner, accelerating at landing from zero to approximately 140 miles per hour. The demand on lighter aircraft is relatively smaller but the performance of tires on landing and taking off is still a critical function of the airplane. Prudent pilots make it their business to know how to take care of their tires.

All tires are made of rubber, either natural or synthetic. The function of rubber is to protect the cord body from cuts, bruises and moisture, and to provide a rolling and braking surface. Aircraft rubber tread may be plain with no pattern, or may have a rib or dimple design. Some treads may include plys of nylon cord embedded in the rubber to help it withstand higher speeds and resist cuts. Aircraft tires may also have an undertread, impregnated with bits of shredded wire that limits the penetration of cuts in the tread.

The body and sidewalls of tires consists of layers or plys of rubber coated nylon cord—all aircraft tires are made with nylon today. Since each ply of cord has all of its strength in one direction, the cords of every succeeding ply run alternately at right angles to each other to give balanced strength. The plys are sometimes reinforced with layers of fabric between the tread and cord body, commonly known as breakers, which help distribute impact and landing shock over a wider area of the tire.

Where the tire meets the rim, it is protected by several layers of steel wires embedded in rubber and wrapped with fabric; these layers are known as beads. The bead gives a base around which the plys are anchored and helps provide a firm fit on the wheel. Aircraft tires, like automobile tires, are either tubeless or tube-type.

Proper Inflation Vital

There are four basic types of aircraft tires in current use. For light general aviation aircraft with non-retractable landing gear, the "smooth contour" tire is most commonly used. This tire is somewhat streamlined for less wind resistance. Probably the most common type of tire used in general aviation today is the low pressure tire, used by all aircraft except jets. The popular tire for today's jets, both military and civilian is an extra high pressure tire. For aircraft which take off and land at even higher speeds than the average jet, a low profile, high pressure tire has been designed.

Proper inflation is the key to aircraft tire maintenance. Because all aircraft tires are now made with nylon cord, allowance must be made for the fact that nylon will stretch during the first 24 hours in place, resulting in a 5 to 10 per cent drop in the air pressure. No new tire should be placed in service until it has been left to stand at least 12 hours after being mounted and inflated to regular operating pressure. The air pressure should then be adjusted to compensate for the decrease in pressure caused by the stretching of the cord body.

There is also usually some air trapped between the tire and the tube at the time of mounting, giving a false pressure reading. As this trapped air seeps out under the beads of the tire and around the valve on the wheel, the tire may become underinflated within a short time.

When tires are inflated under load, the recommended air pressure should be increased by about 4 per cent. This is because the deflected portion of the tire, when standing under load, causes the volume of the air chamber to be reduced and increases the inflation pressure reading. Additional air pressure must be provided by way of compensation.

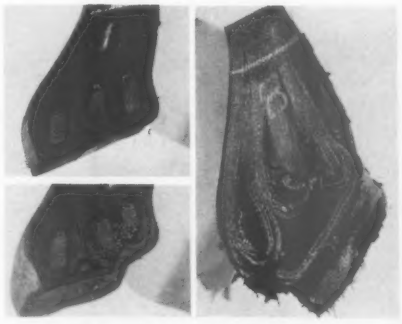
Nylon aircraft tires may develop temporary flat spots when sitting under load. The degree of this flat spotting will vary according to the drop in the internal pressure in the tire and the amount of weight being sustained by the tire. Under normal conditions, the flat spots will disappear by the end of the taxi run. Flat spots are frequently the cause of severe vibration and other unpleasant sensations to pilots and passengers, but are not a source of concern as regards operation of the aircraft.

Whenever aircraft tires are subjected to severe landing shock or other stresses which give rise to concern over possible internal damage, the tires should be dismounted and examined by a mechanic. In ordinary use, tire safety can be protected by attention and by periodic pilot examination without dismounting.

If air leakage appears excessive, check the valves by placing a small amount of water on the end of the valve stem and watching for air bubbles. Make certain that every valve has a cap on it—screwed on firmly. The cap seals in air and serves as protection in case a leak develops in the

Clamshell oven heats tire to simulate temperatures in wheel well of supersonic transport.

What you can't see can hurt you. This severely damaged bead, hidden by wheel flange, can impair tire performance.



Top, left—Initial phase of bead failure. Bottom, left—severe bead damage. Right—Complete tire failure caused by bead damage.

valve core, as well as preventing dirt, oil and moisture from entering the valve. Worn or damaged valves should be replaced.

Retreads are Acceptable

A regular examination of the exterior tread and sidewall of the tire is a good practice for all pilots. Pieces of glass, stones, nails or other foreign objects that might be embedded in the tread should be removed, and cuts or other injuries examined carefully. A dull screwdriver or a blunt awl makes a good examination tool.

In probing a tire injury for foreign material, be careful not to enlarge the injury or to drive the point of the awl or screwdriver into the cord body beyond the depth of the injury. When prying out sharp objects from the tire, take the precaution of holding one hand over the injury in such a way that the eyes are protected in case the object flies out into your face. If the cord body is exposed, the tire should be dismounted and examined further by a mechanic for possible repairs or, if necessary, for discarding.

Retreading is a common practice for aircraft tires employed by airlines as well as by private pilots. The tires on jet airliners, for example, will seldom survive more than 250 landings without being returned to the factory for retreading. Lighter aircraft enjoy longer tire usage under normal conditions, but nevertheless require similar surveillance. Tires that show 80 per cent or more tread wear should either be retreaded if the cord body is in good condition, or discarded.

When tires show uneven wear, they should be dismounted, turned around, and remounted in order to even up the wear. Spotty, uneven wear sometimes is traceable to faulty brakes.

When checking a tire, the entire wheel should be examined for such damage as cracks, checking, or abrasion. When inspecting a mounted tire on the wheel of an airplane, always be sure that nothing is caught between the landing gear and the tire and that no parts of the landing gear are rubbing against the tire. If your aircraft has retractable landing gear, check the nacelle into which the tire fits on retraction. Clearances are sometimes extremely close and any foreign material or loose or broken parts in the nacelle can damage the tire.

It is a matter of some surprise to pilots to learn that more tires fail on takeoff than on landing. The fact that tire failure on takeoff can be extremely dangerous is a good reason for emphasizing proper preflight inspection of tires and wheels. As a matter of fact, improper handling of aircraft during taxiing can cause needless damage and excessive tire wear. Aircraft tires deflect or bulge out at the sidewall about 2½ times more than automobile tires; they are, therefore, subjected to faster tread wear and more vulnerable to surface damage than other types of tires. More of the tire surface is actually in contact with the ground or runway.

As airports grow in size and taxi runs become much longer, there are more opportunities for tire damage and wear. Light plane taxi runs should be no longer than absolutely necessary, and made at speeds no higher than 25 miles per hour. This is especially important for aircraft not equipped with nose wheel steering. By expressing their concern to airport management, pilots are able to help ascertain that ramps, parking areas, taxi strips, runways, and other paved areas are regularly cleaned and cleared of all objects that might cause tire damage.

Careful pivoting of aircraft will help to prolong tire tread life. Compared with automobiles, aircraft turn on a short radius. When one wheel is locked during a turn, the tire on the locked wheel is twisted with great force against the pavement. A small piece of rock or stone that would ordinarily cause no damage can, during a turn, be literally screwed into the tire.

This scuffing or grinding action takes off tread rubber, and places a severe strain on the sidewall and beads of the tire at the same time. Some aircraft and tire manufacturers recommend that whenever possible in turning, the inside wheel be allowed to roll on a radius of about 25 feet during the course of the turn.

Good Landings, Longer Tire Life

Landing habits of the pilot have a clear influence on the longevity of his aircraft tires. Bringing an aircraft in hot and heavy frequently requires such severe use of the brakes that flat spots are produced on the tires. If the brakes are applied when the plane is still traveling at high speeds, the wings will continue to have considerable lift, and the tires may skid on the runway and be damaged beyond further use or conditioning. Similarly, if the pilot applied the brakes after the first bounce, he will be burning rubber unnecessarily. Braking should be delayed until the plane is definitely settled into its final roll.

Incidentaly, recent FAA-NASA tests on hydroplaning have revealed that hydroplaning is less likely to occur when tires are somewhat over inflated. A formula devolved for smooth tires states that the minimum total hydroplaning speed in knots is equal to nine times the square root of the tire inflation pressure ($VH = 9 \times V P$). Extremely slushy airfields should be avoided if possible, but if a takeoff must be made from such an airfield, the pilot should be careful to see that his tires are *not under-inflated.*

Under-inflated tires tend to permit hydrodynamic pressure to be built up between the tire and the pavement, which lifts the tire free from the runway surface. This is, in effect, a premature takeoff— a phenomenon which a safe pilot generally hopes to avoid. Knowing his tires will help him stay on the ground longer. ■

Nursing A Newborn Industry

The SKY GIRLS

Ellen Church Marshall as administrator of the Union Hospital School of Nursing, Terre Haute, Ind.

On a flight from Reno to San Francisco one rough February day in 1930, Steve Stimpson, a ticket agent in Boeing Air Transport's San Francisco Office (a predecessor company of United Air Lines), found himself serving food to the passengers because the co-pilot could not be spared from the cockpit.

This experience reaffirmed his long-held opinion that a steward was needed in the cabin of an aircraft to tend to the needs of the passengers.

Before he had a chance to put this idea into effect, however, an attractive young San Francisco nurse of his acquaintance, Ellen Church, proposed an even more unique idea. It so intrigued Stimpson that he quickly fired off a memo to his company outlining the concept of a steward*ess*.

"Imagine," he wrote, "the psychology of having young women as regular members of the crew . . . the value that they would be to us in the neater and nicer method of serving food and looking out for the passengers' welfare. I am not suggesting at all the flapper type of girl. You know nurses . . . they are not given to flightiness—I mean in the head. The average graduate nurse is a girl with some horse sense and is very practical. The young women that we would select would naturally be intelligent and could handle what traffic work aboard was necessary, such as keeping of records, filling out reports, issuing tickets, etc. They would probably do this as well or better than the average young fellow."

And with that memo, a new profession was born.

Ellen Church succeeded in recruiting seven more pretty nurses courageous enough to take on the job, and she and Stimpson developed a four-page handbook to guide the girls in their new career. Some of their responsibilities included: checking the floor bolts on wicker chair seats to see that they were securely fastened before each flight; tagging all passenger baggage and checking it aboard; punching each ticket at each point en route as passed (13 stops between San Francisco and Chicago); carrying aboard hampers filled with cold chicken, apples, rolls, cake and vacuum bottles of hot coffee; and watching passengers going to the washroom to see that they did not open the exit door by mistake.

Just four months later, clad in snappy green twill, with matching crushed berets, the eight girls were ready to welcome their first passengers and hoist their first baggage.

Ellen Church and her pert band of "sky girls," as some called them, were an instant success with B.A.T. passengers, and within two years competing airlines all followed suit.

Many believe it was the airline hostess who brought early success to air travel. A pretty nurse could soothe the most air-sick passenger—she could take men's minds off the terror of flying when rough air and rough landings upset delicate stomachs.

And when bad weather grounded a flight for sometimes as long as several days, an important item in every stewardess' satchel—the railroad timetable—came to the aid of the air travelers.

Training for the original sky girls included a familiarization flight—mostly to assure that the girls were not overly subject to air sickness themselves. Because this service was new, they had to learn most of the tricks of their trade as they went along.

They found that a ready smile and a fluffy pillow went a long way in comforting a worried traveler. They also learned to make the trips more interesting by putting an altimeter in the cabin so passengers could see how high they were flying, and by pointing out sights of interest along the way. The handbook carried by "student sky girls" grew thicker with each flight. Today's stewardess handbook averages 100 pages.

Often there were few passengers—sometimes none—but there was always mail. With no passengers aboard, the pilots often invited the girls to fly the planes.

Being a pioneer stewardess was fun. Glamor and romance was soon attached to the new career. Wherever the girls went they were requested to appear before Chambers of Commerce, and they frequently appeared on radio programs. They were

Left—a bronze plaque, designed by Rene Shapshak, honoring the memory of Ellen Church Marshall, in the lobby of United Air Lines' stewardess training center near Chicago, Ill., commemorates her devotion both as a nurse and as an airline stewardess.

Right—introduction of the world's first airline stewardesses in 1930 brought new glamour to the Boeing 80-A tri-motor aircraft serving United Air Lines' Chicago-San Francisco route. From left to right: Margaret Arnott, Inez Keller, Cornelia Peterman, Harriet Fry, Jessie Carter, Ella Crawford and in the doorway, Ellen Church and Alva Johnson.

treated like national celebrities.

Today's airline stewardess' career is a far cry from those first eight pioneers. Instead of a one-day training session, the average stewardess is subjected to a rigorous FAA-approved curriculum lasting an average of 5½ weeks. She must pass stiff examinations with a grade of 90 or better before she is allowed to work, and pass again every six months to assure her proficiency.

While a nursing degree is now unnecessary, today's stewardesses are trained to give first aid and mouth-to-mouth resuscitation, operate fire extinguishers, oxygen masks, emergency exits, evacuation chutes—all of which make her indispensible aboard a modern jetliner. More than that, the airline stewardess has become the epitome of independent young womanhood and has attained an image which every teenager admires.

What happened to the young woman who helped establish this exciting profession?

In World War II, Ellen Church went overseas as a captain in the Army Nurse Corps and was awarded the Air Medal in 1944. She was administrator of the Union Hospital School of Nursing, Terre Haute, Ind., from 1951 until 1964. In September of that year she became the wife of Leonard B. Marshall, President of the Terre Haute First National Bank.

Ellen Church Marshall died in 1965 when she was thrown from a horse. She left as her legacy a unique profession with a high standard of dedication to service which exists to this day—a profession that has employed well over 150,000 young women in 38 years.

A bronze plaque, designed by New York sculptor Rene Shapshak, honors her memory in the lobby of United Air Lines' stewardess training center near Chicago, Ill., and a new eight-story wing has been named in her honor.

Nancy Koplinka

Answers to Pre-Flight Quiz

This airplane shouldn't even be taxied, let alone flown.

The large photo shows a deflated nose strut, a brick under the right main gear, a rag protruding from the cowl of the left engine, a loose cowl fastener, pitot cover in place, clothing hanging on the left horizontal stabilizer, underinflated left tire. Camera in left photo should not be on instrument panel (because of the magnet in the exposure meter—all gear in the cabin should be secured). The center photo discloses missing navigation light fairing. In the picture at right, excessive oil in the drip pan is cause for immediate investigation. A little more subtle is the pull chain on the pan—it should be away from the prop. Eleven unsafe conditions—how many did you find?

BRIEFS

• A WORD OF CAUTION ON VOTS has been expressed by FAA's Frequency Management Division Chief, William Hawthorne, who points out the risk in using VHF Omnitest equipment while airborne ("How True is Your Omni?—June, FAA AVIATION NEWS). FAA gives no assurance regarding the quality of VOT signals received while the pilot is airborne. The fact that the pilot may receive a signal is not in itself evidence of adequate signal strength.

• A 23RD CHINA, BURMA, INDIA-HUMP PILOTS ASSOCIATION reunion will be held August 23-25 at Kings Inn, Crockett, Texas. Contact Herb Fisher at The Port of New York Authority, Aviation Department, 111 Eighth Ave., New York, N. Y. 10011. Tel: 212-620-8396.

• NEW FAA TERMINAL INSTRUMENT PROCEDURES (TERPS) are explained in a well-illustrated primer now available. Advisory circular AC 90-1A, "Civil Use of U. S. Government Instrument Approach Procedure Charts," explains the new landing minimum requirements, new standard and non-standard takeoff minimums revised legends featured on the new TERPS charts, plan view symbols, profile information, airfield sketch information and other general information and abbreviations.
AC 90-1A is available free through the Department of Transportation Distribution Unit, TAD 484.3, 800 Independence Ave., S.W., Washington, D. C. 20590.

• OBSTRUCTIONS TO AIR NAVIGATION, and how to make them clearly visible, is the subject of a just-published, 37-page FAA Advisory Circular. In its first major revision in five years, the new edition of "Obstruction Marking and Lighting" takes a detailed look at all aspects of lighting and marking, from colors and types of paint to types of lights, their location and upkeep. Although FAA's standards are not mandatory except when Federal funds are spent for marking and/or lighting of objects, they are generally accepted. "Obstruction Marking and Lighting" (AC 70/7460-1) may be purchased for 40 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

• "Breakaway" cords and tapes which drag the pilot 'chute or main parachute canopy out of its pack will be mandatory for static-line jumps after August 7, 1968, for static line jumps. Once the assist device accomplishes its function—pulling the "pilot" or main 'chute out of the pack—it breaks under the falling weight of the 'chutist. The rule applies to standard "pin" type pack releases, and the "California" pack which substitutes break cords for the steel pins.

The air taxi fleet had 7,430 single engine piston aircraft, 2,848 multi-engine piston aircraft, 25 turboprops and jets, and 690 rotor craft, as of Dec. 31, 1966. The industry employs 7,076 pilots.

U.S. AIR TAXI INDUSTRY IS THRIVING, CENSUS SHOWS

The 1966 FAA census of the air taxi industry, first of its kind, has confirmed with solid numbers what has been known for a long time—it is the fastest growing segment of general aviation.

There were 3,017 air taxi operators actually in business as of Dec. 31, 1966. They operated 11,063 aircraft on a part-time or full-time basis, and they carried 4.7 million passengers in 1966.

The growth of aircraft and the number of hours flown is dramatically shown when contrasted with figures obtained in surveys conducted by FAA in 1957 and in 1962. In 1957 there were only 2,030 aircraft in air taxi service, and 5,234 in 1962, compared to the 1966 total of 11,063.

In 1957, air taxis flew 571,000 hours, and in 1962, the hours soared to 1,499,000. In 1966, air taxis had almost doubled this figure, logging 2,786,000 hours. Air taxi hours flown were 13 per cent of the estimated total for general aviation.

In June 1967, there were 11 air taxi firms carrying mail over 15 routes. At the end of January 1968, air taxi operators were serving 90 routes, and by the end of 1968, the Post Office expects to have 200 routes served by air taxis. Eventually, there may be as many as 250 routes.

Air taxi operators earned an estimated $180,000 in mail revenue in Fiscal Year 1967, and will earn some $8.5 million in Fiscal Year 1968. The Post Office estimates an increase from $12 million to $15.7 million annually during the following four years.

The air taxi industry employees 18,628 persons, including 998 pilots with ATR ratings. Those classed as "other pilots" number 6,078. There are 3,168 certificated mechanics, and 1,765 "other" employees.

A limited number of free copies of the "1966 Census of Air Taxi Operators" is available by writing to FAA, TAD-484.3, 800 Independence Ave., S. W., Washington, D. C. 20590. Requests should be accompanied by a self-addressed mailing label. Operators who participated in the census will automatically receive a copy.

Battery-Powered Transceivers to Keep Towers on the Air

Control towers need not "go off the air" in the future because of power failure, thanks to an FAA program to equip them with portable, self-contained transceivers now under design and development.

The FAA has awarded a $589,488 contract to Hydro-Space Systems Corp., Cedar Rapids, Iowa, to develop a VHF and a UHF prototype, and to deliver 540 VHF and 323 UHF production models. An additional 45 VHF units for the Navy are included in the contract.

Both VHF and UHF models will be three-watt, solid state and powered by 12 volt batteries. They will have a range of at least 15 miles and will have three pre-tuned channels which can be set to any VHF or UHF frequency within the range of frequencies assigned to the aeronautical band. The portable transceivers will have improved speech processing, giving added audio power at lower power output.

Initially, high activity control towers will be equipped with at least one UHF emergency transceiver and one or more VHF transceivers.

Study Guide for Written Portion Of 'Copter' IFR Rating Available

Helicopter pilots preparing to take the written portion of the examination required for an instrument rating can get sound guidance in the just-published FAA "Instrument Rating (Helicopter) Written Test Guide" (Advisory Circular AC 61-45).

The 22-page publication consists of a study outline, a list of requirements and procedures for taking the test, a list of necessary study materials, a sample test with answers, detailed explanations and typical reference materials for taking the sample test.

The booklet contains Federal Air Regulations, air traffic control procedures, aviation weather and pre-flight weather briefing, interpretation and the use of flight instruments, and air navigation with respect to facilities, charts and procedures.

Copies of AC 61-45 may be obtained free from the FAA, TAD 484.3, 800 Independence Ave., S. W., Washington, D. C. 20590. Request should be accompanied by a self-addressed mailing label.

Airport Noise Under FAA Study To Develop Land Use Guidelines

Twenty-nine U. S. airports, ranging from Massachusetts to Washington, and from Florida to Wisconsin, will have their noise calculated in a three-phase study leading to computerized methods for determining present and future noise exposure levels at all U. S. airports.

Under a $164,750 contract let by FAA to Bolt, Beranek and Newman, Inc., Cambridge, Mass., the study will be used by FAA to develop land use guidelines for Federal, state, and local land use planning officials and others concerned with compatible land use around airports.

The guidelines will also be used by government agencies and other involved in aircraft noise abatement programs. The study is also expected to produce the basic data required by FAA to develop noise forecasts for all other U.S. airports.

The 29 airports to be studied represent a good sampling of small, medium, and large general aviation and commercial air traffic: Huntsville, Ala.; Little Rock, Ark.; Concord, Calif.; San Diego, Calif.; Van Nuys, Calif.; Colorado Springs, Colo.; Hartford, Conn.; Washington, D. C.; Melbourne, Fla.; Tampa (new), Fla.; Atlanta/Fulton County, Ga.; Boston, Mass.; Detroit, Mich.

Also, Columbia, Mo.; Mid-Continent, Kansas City, Mo.; Ithaca, N. Y.; Raleigh-Durham, N. C.; Tulsa, Okla.; Portland, Ore.; Erie, Pa.; Nashville, Tenn.; Dallas-Fort Worth, Texas; El Paso, Texas; Dulles, Chantilly, Va.; Leesburg, Va.; Seattle-Tacoma, Wash.; Fond du Lac, Wis.; Milwaukee, Wis.; Wisconsin Rapids, Wis.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• Power Off/On Landings

The "Flight Training Handbook" (AC 61-21) seems to recommend the use of power landing approaches in one place, and several paragraphs later it warns that dependence on power is generally considered a bad habit.

Which type of landing approach is more desirable for instruction purposes and why?

Norman W. Perluss
Avalon, Calif.

Landing approaches have changed in recent years because of the changed flight characteristics of the airplanes, and the increasing complexity of air traffic and traffic patterns at all airports.

Years ago, pilots were trained to make gliding approaches, with the engine throttled from the 180° or key point. This provides excellent preparation for actual forced landings, and good training and practice in recognizing and controlling the glide performance of the airplane used.

The modern approach depends upon carefully controlled airspeed, following a controlled final approach slope angle, and using the established traffic pattern for the airport involved.

Pilots should be instructed in gliding approaches for use in power failure emergencies and approaches with power for normal landing operations. Flight Instructor and Commercial Pilot candidates are required to demonstrate both types in flight tests.

• Asks for a Survey

Why not survey the aviation community on the question of knots or miles? (Flight Forum, Aviation News, April 1968, said in response to a question about the growing use of knots in aeronautical terminology that FAA is attempting to conform to international practice.)

My $20 is on mph for all references. Forcing international expressions on pilots is unrealistic. Next prerequisite: read, speak, understand Russian, French, Chinese, etc?

Wilbur P. Blumenshine
Columbia, Pa.

• Recency of Experience (Cont.)

In a "Flight Forum" item (January 1968) you said that if a pilot was licensed to fly, for example, the Piper Cherokee PA-28-140, he was also qualified to fly the PA-150, 160, 170, 180. Is there some sort of written proof that I can show the fixed base operator that this is so?

Onalaska, Wis.

Our item concerning recency of experience is covered by FAR 61.47a, a copy of which is available in your local General Aviation District Office. Briefly, it says that the flight time involved shall have been in the "specific make and basic model of aircraft, including modifications thereto which do not change its handling or flight characteristics."

Your problem may lie between you and your fixed base operator. Since he is a private entrepreneur he has free choice to set his own standards as to whom he will rent a plane. A brief check ride might settle the matter.

• A-Okay, Top to Bottom

After reading in the March 1968 *Aviation News* where C. E. Neil, El Paso, Texas, commented so favorably on both the quality and quantity of service at the El Paso Flight Service Station, I could not refrain from adding this note.

At our nearby FSS at Nenana, Alaska, in the vast heartland of the last frontier, we have a team that rivals, and perhaps surpasses, the best FSS crew anywhere.

So, from Texas to Alaska, two great extremes, FSS service is noted for its bountiful and pleasing character. I, and many others, deeply appreciate the devotion of these fine people.

Donald B. Hoff
Clear, Alaska

• The Real Breguet

Re your article in the May issue by James Woodall on STOL aircraft:

Your "aircraft rec" is no goodall
The Breguet at Dulles won't hold water
The aircraft that "STOL" the show
Is a Twin Otter.

Basil G. Maile
AOPA

Your observation is otterly true, if somewhat painful. Mr. Woodall was not responsible for the photo caption, which was intended to accompany the picture shown herewith.

• Encore for El Paso

Mr. C. E. Neal's comment in the March "Flight Forum" about the fellows in the El Paso Flight Service Center is 100 per cent correct. Have stopped in El Paso several times in the past few months and they are always very friendly and helpful.

Personalities may differ in the various flight service stations over the country but I have yet to find one that is not courteous, friendly and helpful.

Bill Blewett
Clifton, Texas

• Aeronautical Charts Obligatory?

Is there any Federal Aviation Regulation which has been interpreted to require the pilot in command of either VFR or IFR flight to use aeronautical charts of current edition?

Lorine Shannon
N. Hollywood, Calif.

A pilot is required by FAR 91.5 to take into account information contained in current aeronautical charts provided they are reasonably available to the pilot. However, whether failure by pilots to use current charts constitutes a violation for FAR 91.5 would depend entirely on the circumstances of each case.

On the other hand, FAR 135.71(a)(3) is very explicit and requires the operator of an aircraft subject to Part 135 (air taxi, commercial operations) to furnish the pilot of the aircraft with, among other materials in current and appropriate form, pertinent aeronautical charts. It also requires the pilot to use such charts.

• Can He, or Can He Not?

Can I, as a flight instructor, instruct a student for compensation in his own airplane if the plane has not had a 100-hour inspection, or has not had an annual inspection in the last 100 hours?

I am under the impression that the 100-hour inspection, or the "annual", is required only if the aircraft is for hire, but the flight instructor could fly for hire in any licensed airplane, regardless of hours since last annual.

Joseph E. Garber
Minneapolis, Minn.

You can. FAA interprets FAR 91.169(b) to mean that an individually owned aircraft would not be required to undergo a 100-hour inspection merely because the owner paid a flight instructor to teach him to operate the aircraft. Under this provision, FAA would not consider the student to be a passenger carried for hire.

• Likes New Charts, But . . .

I have only one criticism of the new sectional charts—the higher the terrain depicted, the darker the shading. This makes the chart difficult to read, particularly at night.

Could consideration be given to using the old green-beige-buff background on future printings of the new sectionals?

Catherine Grover
Professional Flying Club
Baltimore, Md.

We agree. Improvements in shading are being made through our cartographic research and development programs. Copies of recent editions of the Washington and Los Angeles sectionals show improved depiction of hill shading and gradient tints.

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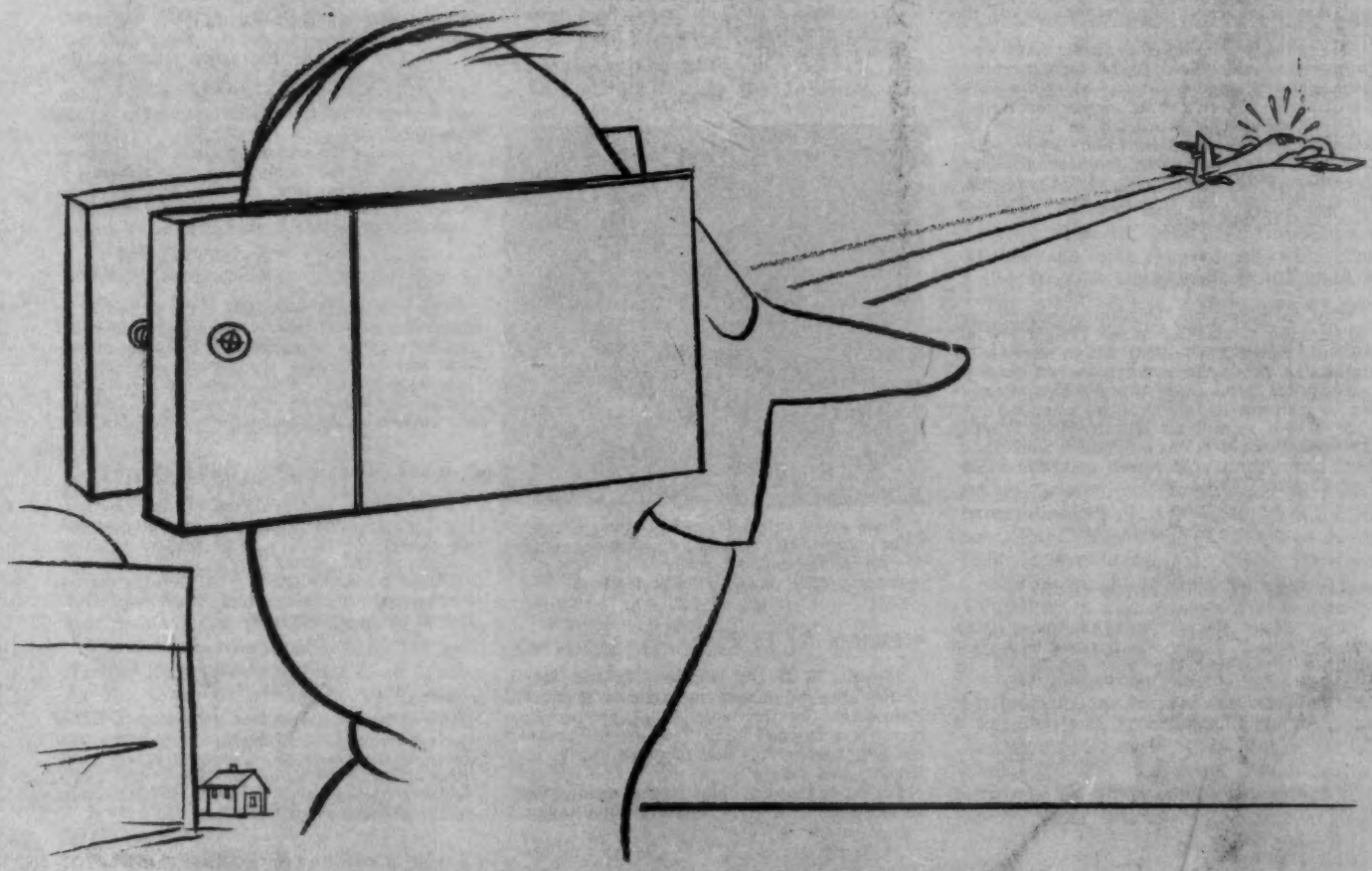

Osborn

Or you may run clear out of sky